Recent Marshall Space Flight Center Natural Environments Branch Terrestrial & Planetary Environments Team Activities

August 2016 Natural Environments
Day-of-Launch Working Group Meeting

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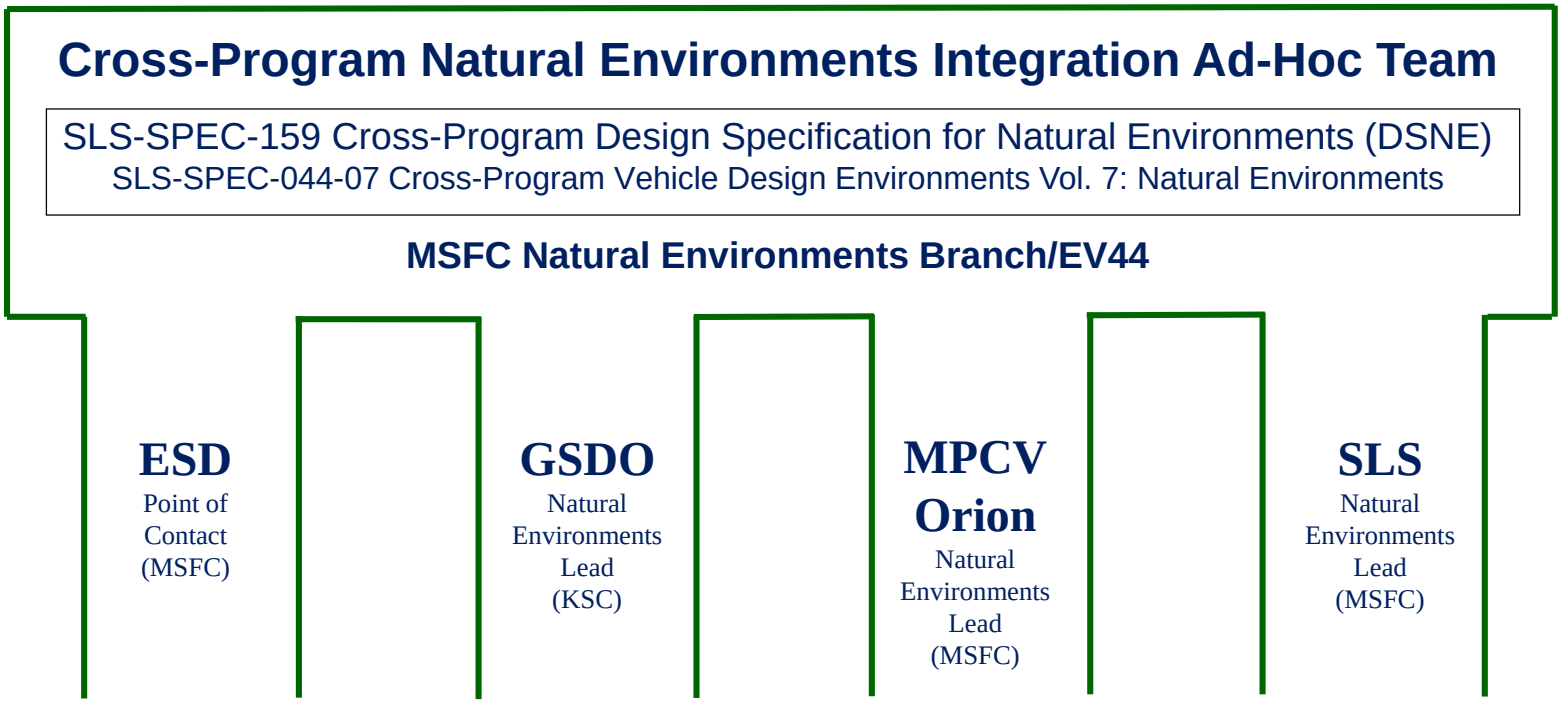
Exploration Mission-1 (EM-1) Support

- EM-1 Launch planned for late 2018
- There are three programs under the Exploration Systems Development Division (ESD) at NASA HQ working toward the launch
  - Space Launch System (SLS)
  - Orion Multi Purpose Crew Vehicle (MPCV)
  - Ground Systems Development and Operations (GSDO)
  - Also, ESD has a Cross-Program function to ensure all the programs are integrated for the EM-1 launch

ESD Natural Environment Cross-Program Function



Exploration Systems Development (ESD)
Ground Systems Development and Operations (GSDO)
Marshall Space Flight Center (MSFC)
Multi-Purpose Crewed Vehicle (MPCV)
Space Launch System (SLS)

Cross-Program Support Activities

- Developed draft version of the weather section of the Exploration Mission 1 (EM-1) Launch & Recovery Program Requirements Document
- Developed verification and validation (V&V) strategy for cross-program natural environments to support closure of SLS CDR RID
  - SLS-SPEC-044-07 Cross-Program Vehicle Design Environments Vol. 7: Natural Environments is currently being updated to include V&V information
  - SLS-SPEC-159 Cross-Program Design Specification for Natural Environments (DSNE) is going to be updated with V&V information in late 2016

SLS Support Activities

- Supported review of natural environment related OMRs and hazard reports for SLS
- Reviewed design discrete gust magnitudes and implementation methodology for SLS dynamic load assessments. Discrete gust implementation was determined to be under conservative. Future assessments will utilize continuous turbulence forcing functions.
- Provided launch availability assessment of various liftoff ground wind constraints for SLS Block 1B
- Provided recommendation for SLS liftoff ground wind LCC evaluation. Recommendation is to use the four heights on the Lightning Protection System towers at Pad 39B
- Provided support to the Day-of-Launch Initialization-Load Update (DOLILU) development activities

Orion MPCV Support Activities

- Supported Orion CDR
  - Request for Action (RFA) closeouts continued into 2016
- Supported European Service Module (ESM) CDR
  - Some Orion CDR RFAs remained open until this CDR was completed
  - ESM plans to implement SLS-SPEC-159 DSNE Rev. D design criteria after CDR
    - Currently using Rev. C
- Provided Thermal Protection System (TPS) charging analysis guidance.
  - Leading discussions on analysis for new tape-like coating
- Performed an analysis of cold air temperatures within the nominal and off-nominal landing footprints for a Roll Control System valve sensitivity study

Other Activities

- Earth Global Reference Atmosphere Model (GRAM) version 2016 to be released later this year
  - Primary update is code change from FORTRAN 90 to C++
- In the process of updating Mars & Venus GRAM's
  - Updating global circulation model data used in the code
- Continued archival (quality control) of terrestrial data from KSC/Eastern Range
  - Primarily consisting of data passed through the Range External Interface Network (REIN)
  - Looking into new data formats to replace the old MDTF format